

REMARKS

In the Office Action, the Examiner rejected claims 1, 2 and 5-15. Claims 3, 4 and 16-21 have been withdrawn from consideration. Applicants request reconsideration of claims 1, 2 and 5-15 in view of the amendments set forth above and the following remarks.

Rejection under 35 U.S.C. § 112, First Paragraph based on enablement requirement

The Examiner rejected claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph as failing to comply with the enablement requirement. The Applicants respectfully traverse this rejection.

Regarding the *enablement* requirement, the Examiner has the initial burden to establish a *reasonable basis* to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). The test for enablement, as set forth by the Supreme Court, is whether the experimentation needed to practice the invention is undue or unreasonable. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d 1331, 1332 (Fed. Cir. 1991). The *undue experimentation* test essentially evaluates whether one of reasonable skill in the art can make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. *U.S. v. Teletronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988). As long as the specification discloses at least one method for making and using the claimed invention that bears a *reasonable correlation* to the entire scope of the claim, then the enablement requirement of Section 112 is satisfied. *In re Fisher*, 427 F.2d 833, 839, 166 U.S.P.Q. 18, 24 (C.C.P.A. 1970).

Independent claim 1 recites that each of a plurality of semiconductor die stacks comprises “at least two semiconductor die permanently coupled together by adhesive and wherein the plurality of semiconductor die stacks *do not include a lead frame or a substrate*.” (Emphasis added). Similarly, claim 10 recites that each of a plurality of semiconductor die stacks comprises “at least two semiconductor die coupled together by set

adhesive that has been cured and wherein the plurality of semiconductor die stacks *do not include a lead frame or a substrate.*” (Emphasis added).

In rejecting independent claims 1 and 10, the Examiner stated the following:

The definition of a substrate is a supporting material on or *in which* the components of an integrated circuit are *fabricated or attached*, or an insulating layer that components are formed on; therefore, since the dies contain circuits formed in semiconductor substrates the stack includes a substrate. Alternatively, the die stacks are formed on/attached to a holder albeit temporarily and therefore the holder is still with the definition of a substrate. As such, the claim is not enabled, since one skilled in the art to which it pertains, or with which it is most nearly connected, cannot make a stack formed on *what it excludes*.

Office Action, p. 2 (emphasis in original).

Regarding the enablement requirement of 35 U.S.C. § 112, first paragraph, Applicants assert that one of ordinary skill in the art would clearly understand how to form a die stack *without a substrate* based on the disclosure of the present application. *See, e.g.*, Application, page 17, line 16 – page 18, line 11. Indeed, this concept is discussed throughout the application and distinguishes present embodiments from prior art in which packages are assembled by sequentially stacking die directly on a substrate. For example, in various places throughout the present application, a temporary holding surface is contrasted with a substrate. *See, e.g.*, page 12, lines 15-17.

The Examiner’s assertion that one of ordinary skill in the art would be confused about the meaning of the term “substrate” is unfounded. Indeed, Applicants assert that based on the context in which the term “substrate” is used in the specification and based on the customary meaning of the term in the art, one of ordinary skill in the art would clearly understand the intended meaning. Further, Applicants assert that any confusion with respect to this claim feature merely arose because the Examiner attempted to provide his own definition for the term and that definition is unreasonably broad. Those skilled in the art would not make such an

interpretation, nor would they be confused as to how to make or use the invention, as recited in the present claims.

First, the Examiner apparently asserted that a die stack inherently includes a substrate. *See* Final Office Action, page 2. This is clearly not the case. Indeed, the claim language set forth in claims 1 and 10, on its face, clearly indicates that the die stacks *do not include* substrates. Additionally, the specification clearly indicates that die stacks are eventually *stacked on* a substrate to form a package. They are not *integral with* the substrate. Further, the term “substrate” has a well known meaning in the art. Based on the context in which the term is utilized in the specification, one of ordinary skill in the art would readily discern the intended meaning. For example, the die stacks are described as being coupled to the substrate to form a package, such as the packages illustrated in FIGS. 2 and 3 of the application. *See e.g.*, Application, page 18, lines 9-11. Prior to coupling the die stacks to the substrate, the die stacks do not include a substrate, and certainly do not form a package.

While it is true that integrated circuit dies are formed within or on a semiconductor material, those skilled in the art would not interpret an integrated circuit die or chip as including a substrate, semiconductor or otherwise. That is, those skilled in the art would not interpret a die or chip as having a substrate. This assertion by the Examiner has no technical basis and those skilled in the art would not reach this conclusion. Rather, as is clear from the present specification, those skilled in the art would fully appreciate that a semiconductor die is independent from a substrate.

Second, the Examiner apparently asserted that the temporary holding surface is a substrate. *See* Final Office Action, page 2. Again, this is clearly not the case. As set forth above, the term “substrate” has a well known meaning in the art. The definition that is apparently being asserted by the Examiner is unreasonably broad. Indeed, according to the Examiner it seems that anything on which a die stack is placed can be interpreted as a substrate. This clearly does not fit with the customary meaning of the term or the meaning of the term based on the context of its use throughout the present application. For example, as set forth in

the present application, attaching a substrate to a die stack forms a package. *See e.g.*, Application, page 17, line 16 – page 18, line 11. However, when a die stack is placed on a temporary holding surface, a package is not formed. Attachment to a substrate is clearly understood by those skilled in the art to connote a permanent attachment, rather than a temporary placement.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, as well as those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, Applicants request that the Examiner withdraw the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, and provide an indication of allowance for claims 1, 2 and 5-15.

Rejection under 35 U.S.C. § 112, First Paragraph based on written description requirement

The Examiner rejected claims 1, 2, and 5-15 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. The Applicants respectfully traverse this rejection.

Regarding the *written description* requirement, the initial burden of proof regarding the sufficiency of the written description falls on the Examiner. Accordingly, the Examiner must present evidence or reasons why persons skilled in the art would not recognize a description of the claimed subject matter in the applicant's disclosure. *In re Wertheim*, 541 F.2d 257, 262, 191 U.S.P.Q. 90, 96 (CCPA 1976). The written description requirement does not require the claims to recite the same terminology used in the disclosure. The patentee may be his own lexicographer. *Ellipse Corp. v. Ford Motor Co.*, 171 U.S.P.Q. 513 (7th Cir. 1971), *aff'd*, 613 F.2d 775 (7th Cir. 1979), *cert. denied*, 446 U.S. 939 (1980). Moreover, any information contained in any part of the application as filed, including the specification, claims and drawings, may be added to other portions of the application without introducing new matter. Accordingly, if an application as originally filed contains a claim disclosing material not disclosed in the remainder of the specification, the applicant may amend the specification to include the claimed subject matter. *In re Benno*, 768 F.2d 1340, 226 U.S.P.Q. 683 (Fed. Cir. 1985).

In rejecting independent claims 1 and 10, the Examiner stated the following:

There is no support in the specification for the negative limitation that the die stacks do not include a lead frame.

Office Action, p. 3.

Applicants assert that the present application complies with the written description requirement of 35 U.S.C. § 112, first paragraph. Specifically, Applicants assert that sufficient support is provided in the specification for the negative limitation that the die stacks do not include a lead frame or a substrate. For example, numerous times throughout the application a die is explicitly described as being coupled merely to other die and not to a substrate. *See e.g.*, Application, page 17, line 16 – page 18, line 11. While Applicants concede that a lead frame is different than a substrate, the indication by the present specification that the die stack is not coupled to a substrate is sufficient to indicate that the die stack is not coupled to a lead frame either since those skilled in the art would appreciate that attachment to a lead frame is simply an alternative to attachment of the dies to a substrate. One of ordinary skill in the art would recognize this. Further, FIGS. 5A, 5B, 5C, and 5D all illustrate die stacks that are not coupled to a lead frame. The point is that the die stacks are formed before attachment to a permanent surface, such as a substrate or lead frame, for formation of a package. Those skilled in the art would clearly recognize the description of the recited subject matter to exclude attachment of the die stack to a lead frame.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, as well as those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, Applicants request that the Examiner withdraw the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, and provide an indication of allowance for claims 1, 2 and 5-15.

Claim Rejections under 35 U.S.C. § 112, Second Paragraph

The Examiner rejected claims 1, 2 and 5-15 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. The Applicants respectfully traverse this rejection.

The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph, is whether the claim meets the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available. *See* M.P.E.P. § 2173.02. Although the Examiner may take exception to the terms used in the claims, the patentee may be his own lexicographer. *Ellipse Corp. v. Ford Motor Co.*, 171 U.S.P.Q. 513 (7th Cir. 1971), *aff'd*, 613 F.2d 775 (7th Cir. 1979), *cert. denied*, 446 U.S. 939 (1980). The Applicant may use functional language, alternative expressions, negative limitations, or any style of expression or format of claim which makes clear the boundaries of the subject matter for which protection is sought. *See* M.P.E.P. §§ 2173.01 and 2173.05; *In re Swinehart*, 439 F.2d 10, 160 U.S.P.Q. 226, (CCPA 1971). The Examiner is also reminded not to equate breadth of a claim with indefiniteness. *In re Miller*, 441 F.2d 689, 169 U.S.P.Q. 597 (CCPA 1971).

The essential inquiry pertaining to the definiteness requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. *See* M.P.E.P. § 2173.02. As set forth in Section 2173 of the Manual of Patent Examining Procedure, definiteness of claim language must be analyzed, not in a vacuum, but in light of:

- (A) The content of the particular application disclosure;
- (B) The teachings of the prior art; and
- (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

In reviewing a claim for compliance with 35 U.S.C. 112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill

in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. 112, second paragraph, by providing clear warning to others as to what constitutes infringement of the patent. *See Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1379, 55 U.S.P.Q.2d 1279, 1283 (Fed. Cir. 2000). Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite. *See Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366, 71 U.S.P.Q.2d 1081, 1089 (Fed. Cir. 2004). Accordingly, a claim term that is not used or defined in the specification is not indefinite if the meaning of the claim term is discernible. *See Bancorp Services, L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1372, 69 U.S.P.Q.2d 1996, 1999-2000 (Fed. Cir. 2004).

Independent claim 1 recites:

A temporary holding surface having a plurality of semiconductor die stacks thereon, the temporary holding surface *configured to temporarily hold the plurality of semiconductor die stacks*.

(Emphasis added).

Independent claim 10 recites:

A tape reel having a plurality of semiconductor die stacks thereon, the tape reel *configured to temporarily hold the plurality of semiconductor die stacks*.

(Emphasis added).

In rejecting independent claims 1 and 10, the Examiner stated the following:

The term “configured,” while applicant’s specification makes mention of the configuration of chips (e.g., different sizes etc.) it is completely silent as to how the “holder is *configured* ...” except to say, “[t]he holding surface is considered temporary in that the wafer itself may be used to temporarily hold, transfer, test or store one or more die stacks *for example*.” There is nothing in the specification that would apprise one of the metes and bounds of how the substrate was configured or the structural limitations imparted.

Office Action, p. 3 (emphasis in original).

Additionally, in a footnote, the Examiner stated:

Note, a substrate/PCB that a chip is soldered may be considered temporary in that the chip may be removed (e.g., defect in chip).

Office Action, pp. 3-4.

As set forth in the specification and throughout the prosecution history, embodiments of the present invention distinguish over the prior art, in part, because a completed die stack (e.g., a die stack that has been cured and/or tested to confirm it is a functional die stack) is formed prior to attaching the die stack on a substrate. In other words, after the die stack is formed, it exists separate from the substrate. Thus, the die stack may be positioned on a temporary holding surface (e.g., film frame, gel pack, tape reel, or JEDEC tray) before removing the die stack and coupling it to a substrate to form a package. In contrast, prior art die stacking techniques begin formation of a package by stacking die directly on a substrate. Accordingly, the prior art merely includes complete die stacks that include a substrate since the die stacks are formed directly on the substrate. It should be clear from this explicitly noted contrast between the prior art and the present invention that a holding surface *configured to temporarily hold the plurality of semiconductor die stacks* is a surface that allows the die stacks to be readily removed for coupling to a substrate. For example, the temporary holding surface may allow ready removal with a stacking tip or removal via separation of an individual die, if the temporary holding surface is a die wafer. See, e.g., Application, page 10, line 16 – page 11, line 2. Applicants note that “configured” is commonly used in claims and is well understood to refer to elements that are sized, arranged or manufactured to form a specified structure or achieve a specified result. In this case, the holder is sized, arranged or manufactured to *temporarily* hold a die stack. The meaning is clear and the context and usage of the terminology would be readily ascertainable by those skilled in the art. Therefore the claim is fully compliant with 35 U.S.C. § 112, second paragraph

Further, contrary to the Examiner’s assertions, the temporary holding surface is certainly not a substrate to which a die stack is soldered. This would clearly be an unreasonable interpretation. While parts that are soldered to other parts can indeed be separated, the purpose of a solder connection is to permanently attach the parts together. Apparently, according to the Examiner, any

type of surface or connection would be “temporary,” if the connection could ever be severed or destroyed. This again is not a reasonable interpretation, nor is it one that those skilled in the art would make.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, and those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, second paragraph. Accordingly, Applicants request that the Examiner withdraw the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, second paragraph. Further, Applicants request that the Examiner provide an indication of allowance for claims 1, 2 and 5-15.

Claim Rejections under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 1 and 5 under 35 U.S.C. § 102(b) as being anticipated by “Fujimoto (JP 6,255,726).” However, Applicants believe the Examiner intended to cite Fujimoto et al. (Foreign Patent No. JP 62266762)(“the Fujimoto reference”), a copy of which was apparently included with the Office Action. Accordingly, Applicants base the present arguments on the Fujimoto reference. If the Examiner intended to cite “Fujimoto (JP 6,255,726),” Applicants respectfully request that the Examiner provide an English translation of the reference. Regardless, Applicants respectfully traverse this rejection.

Anticipation under 35 U.S.C. § 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985). For a prior art reference to anticipate under 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). That is, to maintain a proper rejection under 35 U.S.C. § 102, a single reference must teach each and every element or step of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). Indeed, the cited reference must not only disclose all of the recited features but must also disclose the part-to-part relationships between the features. *See Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 486 (Fed. Cir.1984). Accordingly, the Applicants need only point to a single element or claimed

relationship not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

Embodiments of the present invention are directed to one or more die stacks that are deposited on a temporary holding surface in a *completed* form. *See* Application, page 12, lines 11-13. For example, using a stacking tip, a completed die stack may be positioned on a temporary holding surface (e.g., a film frame, gel pack, tape reel, or JEDEC tray) for later attachment onto a substrate. *See id.* Thus, the temporary holding surface is configured to temporarily hold the completed die stack for eventual transfer to a permanent coupling with a substrate. For example, the temporary holding surface may facilitate removal of a completed die stack from the temporary holding surface with a stacking tip. The die forming a completed die stack may be permanently coupled together in the stacked formation prior to moving the die stack from the temporary holding surface to the substrate. For example, the die stack may be cured at a high temperature prior to moving the die stack from the temporary holding surface to the substrate, wherein the curing may set adhesive between die of the die stack to permanently couple the die in the stack together. *See id.*, page 10, lines 1-2 and page 12, lines 13-15. Additionally, prior to attachment to the substrate, the die may be tested to ensure that all die in the stack are functional, thus forming a known good die stack. *See id.*, page 12, lines 15-17.

Accordingly, as amended, independent claim 1 recites, *inter alia*, “A temporary holding surface having a plurality of die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die *permanently* coupled together.” (Emphasis added). As amended, independent claim 10 recites, *inter alia*, “A tape reel having a plurality of semiconductor die stacks thereon, the tape reel configured to temporarily hold the plurality of semiconductor die stacks, wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die coupled together by *set adhesive that has been cured.*” (Emphasis added).

In contrast, the Fujimoto reference merely discloses semiconductor chips that are coupled together via adhesive tape and coupled to a lowermost adhesive tape. *See* Fujimoto et al., pages 1-2. The chips are apparently formed by cutting semiconductor wafers that are coupled together via the adhesive tape on the lower adhesive tape, and then stretching the lower adhesive tape to separate the piles of newly separated semiconductor chips. *See id.*; *see also* FIGS. 1-2. Once the semiconductor chips are formed and separated on the lower adhesive tape, they are apparently removed for use elsewhere. *See id.*, page 2. Further, the Fujimoto reference appears to indicate that once an individual chip is removed from its respective pile, the remaining tape may be removed using other highly adhesive tape. *Id.* In other words, the Fujimoto reference is merely directed to cutting up multiple wafers into die in piles that are unassembled and untested.

Thus, the Fujimoto reference clearly does not disclose “A temporary holding surface having a plurality of die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die *permanently* coupled together,” as recited in claim 1. (Emphasis added). Further, the Fujimoto reference certainly does not disclose “A tape reel having a plurality of semiconductor die stacks thereon, the tape reel configured to temporarily hold the plurality of semiconductor die stacks, wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die coupled together by *set adhesive that has been cured*,” as recited in claim 10. (Emphasis added). Accordingly, Applicants request that the Examiner withdraw the rejection of independent claims 1 and 10 and the claims depending therefrom. Further, Applicants request that the Examiner provide an indication of allowance for claims 1 and 10 and the claims depending therefrom.

Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 6-8 under 35 U.S.C. § 103(a) as being unpatentable over the Fujimoto reference. Further, the Examiner rejected claim 2, 10 and 11 under 35 U.S.C. § 103(a) as being unpatentable over the Fujimoto reference, in combination of Yajima (Foreign Pat. No. JP 362048037) (“the Yajima reference”). Also, the Examiner rejected claim 9 under

35 U.S.C. § 103(a) as being unpatentable over the Fujimoto reference in combination with Ang (U.S. Pat. No. 6,599,764) ("the Ang reference"). Also, the Examiner rejected claims 12-14 under 35 U.S.C. § 103(a) as being unpatentable over the Fujimoto reference, in Combination of the Yajima reference. Finally, the Examiner rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over the Fujimoto reference and the Yajima reference and further in combination with the Ang reference.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). To establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). In establishing a *prima facie* case for obviousness, "the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined." *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 at 1729 (2007).

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. Moreover, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); *see* M.P.E.P. § 2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984); *see* M.P.E.P. § 2143.01(V).

Applicants note that all of the claims rejected under 35 U.S.C. § 103 are each dependent (directly or indirectly) on either independent claim 1 or independent claim 10. Thus, each of the claims rejected under 35 U.S.C. § 103 depends from a claim rejected under 35 U.S.C. § 102, based on the Fujimoto reference. As discussed above, the Fujimoto reference does not disclose each and every feature recited in independent claims 1 and 10. Further, the Examiner's assertions regarding the secondary references do not remedy the deficiencies of the Fujimoto reference. As such, none of the cited references whether considered alone or in a hypothetical combination are believed to render the presently pending claims obvious. Further, the cited references do not disclose certain features specifically recited in the dependent claims. For example, none of the cited references discloses "a known good die stack" positioned on a tape reel configured as a temporary holding surface, as recite in amended claims 8 and 14. Accordingly, in view of the arguments set forth above, Applicants respectfully request that the Examiner withdraw each of the rejection under 35 U.S.C. § 103 and provide an indication of allowance for claims 2, 5-9 and 11-15.

Conclusion

In view of the remarks set forth above, Applicants respectfully request allowance of claims 1-21. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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